Publishable executive summary

CONTRAST periodic activity report 3

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"A multidisciplinary alliance to optimize schistosomiasis control and transmission surveillance in sub-Saharan Africa"

Acronym
CONTRAST

Project summary

CONTRAST is a multidisciplinary alliance bringing together key skills and expertise to generate new knowledge on biological, environmental and socio-economic factors relating to schistosomiasis in sub-Saharan Africa. The project complements ongoing chemotherapy campaigns based on the drug praziquantel and will deliver more effective strategies for long-term control of this debilitating disease.

What is schistosomiasis?
Schistosomiasis, or bilharzia, is a tropical disease caused by intestinal worms of the genus Schistosoma. The transmission cycle requires contamination of surface water by excreta, specific freshwater snails as intermediate hosts, and human water contact.
According to WHO 200 million people are infected worldwide and more than 650 million people live in endemic areas, a majority of these in Africa. As a result schistosomiasis leads to the loss of 1.53 million disability-adjusted life years (DALY), although these figures need revision.

Aim of project
CONTRAST focused on integrated long term solutions leading to improved and sustainable local control of schistosomiasis. To reach this goal, **CONTRAST**s five European partners (established research institutes and a representative from the commercial sector) have together with 9 African institutions established a strong research node network across sub-Saharan Africa.

The research nodes in Africa have been established and are focusing on:

- innovative molecular tools to characterize both snails and schistosomes.
- the importance of host-parasite dynamics across different ecological and epidemiological settings.
- developing new spatial models for disease risk maps and prediction.
- encouraging and assessing novel local control interventions using a social science approach.
- ensuring widespread dispersal of knowledge and access to information facilitating research into practice.

CONTRAST is committed to creating a new and much needed platform for integrated schistosomiasis control in Africa, which will be effective and sustainable at the local, national and regional level.

CONTRAST has created strong south/south collaboration, and will secure a more effective dissemination.

Contractor/Partner list

Partner no.	Partner	Country
1 (coordinator)	DBL - Institute for Health Research and Development	Denmark
2	Natural History Museum	UK
3	Swiss Tropical Institute	Switzerland
4	Imperial College London	UK
5	Makerere University	Uganda
6	University of Zambia	Zambia
7	National Museums of Kenya	Kenya
8	Institut Senegalais de Recherches Agricoles	Senegal
9	Programme National de la lutte contre la Bilharziose	Niger
10	Centre for Schistosomiasis and Parasitology	Cameroon
11	Ministry of Health- Helminth Control Laboratory	Tanzania (Zanzibar)
12	National Institute of Medical Research	Tanzania
13	Coris Bioconcept	Belgium
14	Ministry of Health-Vector Control Division	Uganda

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Scientific and technical objectives:

Objective 1. Molecular tools for new insight into snail-schistosome transmission biology
To develop and implement novel molecular DNA assays based upon polymerase chain reaction (PCR) approaches upon collections of schistosomes and snails, from selected West-Central- and East African environments.

Expected outcome: (1) Real-Time PCR rapid diagnostic tests for detection of schistosome DNA in freshwater snails and establish patterns of schistosome infestation in aquatic environments through time. (2) An international standardized molecular nomenclature based upon DNA barcoding and selected micro-satellite loci for classification of genetic variation

within schistosomes, and their associated snail hosts. (3) An established molecular research node in Uganda and a biological reference research collection node in Kenya.

Objective 2. Characterisation of schistosome-snail relationships and transmission potential

To investigate the schistosome-snail relationship in greater detail in various eco-epidemiological settings across West-, Central- and East Africa to assess and quantify disease transmission potential.

Expected outcome: (1) Identification of key biological factors that shape the distribution of schistosomiasis by ascertaining exact compatibility spectra of key snail species, with particular attention paid to snail infection rate population dynamics such as seasonality and major ecological transformations. (2) Key biological data concerning the distribution of *Bulinus* and *Biomphalaria* and their associated compatibility with schistosomes to annotate spatial databases and verify transmission predictions. (3) An established snail-parasite research node in Cameroon.

Objective 3. Spatial epidemiology for schistosomiasis risk mapping and prediction

To identify key risk factors that govern the frequency and transmission dynamics of schistosomiasis and to quantify spatio-temporal disease patterns in selected eco-epidemiological settings across Africa.

Expected outcome: (1) Comprehensive GIS databases and schistosomiasis risk maps for selected eco-epidemiological settings across sub-Saharan Africa. (2) Spatial refinement of control interventions for cost-effective allocation of scarce resources. (3) Spatially-explicit databases of schistosome and snails annotated by molecular nomenclature maintained on a web-based interface. (4) Integration of spatial databases with other neglected diseases. (5) An established spatial epidemiology research node in Zambia.

Objective 4. Social sciences approaches to better understand and encourage local control interventions

To assess and quantify the negative effect of schistosomiasis on the daily lives of people living in endemic areas, and to measure beneficial effects following local control interventions.

Expected outcome: (1) Evaluation of PHAST strategy (2) The performance of biological control of *S. haematobium* using refractory snail species and feasibility of using this method in coastal eastern Africa. (3) An established research node in Tanzania for integrated social and economic policy analyses.

Objective 5. Outreach and dissemination facility established

To collate all information generated by the project and make available to partners and global audience.

Expected outcome: (1) A website established inclusive of a comprehensive database giving relevant information for open access between CONTRAST's partners as well as interested

health policy stakeholders. (2) Establishment of an electronic advocacy platform for health policy review giving public outreach. (3) Publications, workshops and other information media mobilised for outreach and dissemination.

It was the overall aim of this project to achieve sustainable schistosomiasis control at the public health level in selected countries in sub-Saharan Africa through development of locally adapted and appropriate intervention strategies, complementary with ongoing morbidity control using the anthelmintic drug praziquantel (PZQ).

Work performed

The official starting date of the project was 1st October 2006, when a kick-off workshop for all partners was held in Entebbe, Uganda.

Having finalised the project period all 23 work packages have been implemented and finalised.

CONTRAST has established 5 new state-of-the-art research nodes that have formed the back bone of the CONTRAST project they are ready for future research work on neglected tropical diseases at partners and their associated institutes. The research nodes and their aims are:

1. A node for molecular biological studies creating innovative molecular tools to characterize both snails and schistosomes. This is placed at the Makerere University (MU) in Kampala, Uganda.
2. A node who defines the importance of host-parasite dynamics across different ecological and epidemiological settings. The research node is placed at Centre for Schistosomiasis and Parasitology (CSP) in Yaoundé, Cameroon
3. A GIS research node for developing new spatial models for disease risk maps and prediction. This is placed at the University of Zambia (UNZA), in Lusaka, Zambia.
4. Node 4 is working for encouraging and assessing novel local control interventions using a social science approach. This is placed National Institute of Medical Research (NIMR), in Mwanza, Tanzania and
5. The aim of research node 5 is twofold: 1) to ensure widespread dispersal of knowledge and access to information facilitating research into practice (this include a comprehensive Database called Fireflower), and 2) create reference collections for all parasites and snails. The reference collection is established at the National Museums of Kenya, (NMK) in Nairobi, Kenya.

Within the implemented work packages, field activities have taken place in the field site identified during the first activity period. Field sites were defined in Senegal, Niger, Cameroon, Uganda, Kenya, Zambia, Tanzania and Zanzibar. Control treatments, snail samples and other material have been collected in the field. This has made it possible to initiate laboratory research. Georeferenced field data have been used to develop predictive models in CONTRAST's third objective group.

Within **objective group 1** the research node was established according to the schedule and at the involved partners all workpackages has been engaged and exciting results have been obtained. Barcodes for schistosomes and intermediate host snails has been established to the

extent it is possible, what seems to be a new snail species has been found and new tools has been developed. Insight in genetic diversity of schistosomes and snails has been revealed and genetic consequences of chemotherapy has been established. Findings from these studies are currently being implemented in the studies on host-parasite relationship in optimizing control of the disease.

Within **objective group 2** a full functional host-parasite relationship research node was established and susceptibility experiments have been carried out. A parasitology training course for technicians in field collection and laboratory facilities and the latest techniques in packing, preservation, shipment and infection in laboratory has been performed. Extremely interesting results concerning co-infection and treatment aspects has been obtained. It has been shown how different parasites from different regions react to chemotherapy and how different some parasites are in productivity in different snails . These results will have significant influence on planning of future control regimes.

A unique and very comprehensive open access databse of historical and present information on schistosomiasis prevalence revealing disease distribution in sub-Saharan Africa has been produced in **objective group 3**. These data has been used and are being used in mapping disease distribution in SubSaharan Africa. This is useful in planning schistsosomiasis control interventions. The research node is fully up and running. The node has implemented several course activities both for CONTRAST partners and other sub-Saharan partcipants. The open access database including disease distribution data is not to be confused with the other CONTRAST database, Fireflower, which include CONTRAST provided data only and has been established at research Node 5. In objective group 3 also risk mapping for the areas involved has been carried out. This will also contribute to a better and more uptimized planning of control initiatives.

Within **objective group 4** the research node has been established and the work packages implementing KAP (Knowledge, attitudes and practices) toward schistosomiasis control and PHAST (Partcipatory Hygiene and Sanitation Transformation) approach have been implemented. The results is very promising and Phast has shown to have an impact on peoples performance and attitudes concerning their water contact behaviour. A manual for PHAST in schistosomiasis control has been developed.

Within **objective group 5** a website for the project was launched in January 2007: http://www.eu-contrast.eu. In this website two levels of access have been created; one public 'popular' website, presenting news and stories relating to CONTRAST and other schistosomiasis related information, and one restricted to CONTRAST partners and the European Commission (as well as those bodies with local relevance and any others appointed by the EU.

CONTRAST has been proactive in dissemination of its results through publications in special issues of the well recognised International Journal Parasitology and an upcoming special issue exclusively for CONTRAST in Acta Tropica another well recognised international Journal. Also CONTRAST has reach out to national and international health care stakeholders by participating in meetings and arranging press conferences in correspondence to annual meetings. In this way CONTRAST has been made known through newspapers, radio and television. Like wise CONTRAST partners has played an important role at WHO expert and technical review meetings.